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(71) **Applicant** *(for all designated States except US)*: **TELE-FONAKTIEBOLAGET LM ERICSSON (publ)** [SE/SE]; S-164 83 Stockholm (SE).

(72) **Inventors; and**
(75) **Inventors/Applicants** *(for US only)*: **EKSTRÖM, Bo** [SE/SE]; Kommendörsgatan 25, S-114 48 Stockholm (SE). **WALLINDER, Sören** [SE/SE]; Skansvägen 14, S-136 70 Haninge (SE).

(74) **Agent: ERICSSON AB**; Patent Unit Core Networks, Tele-fonplan/Älvsjö, S-126 25 Stockholm (SE).

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(54) **Title:** MONITORING IN A TELECOMMUNICATION NETWORK
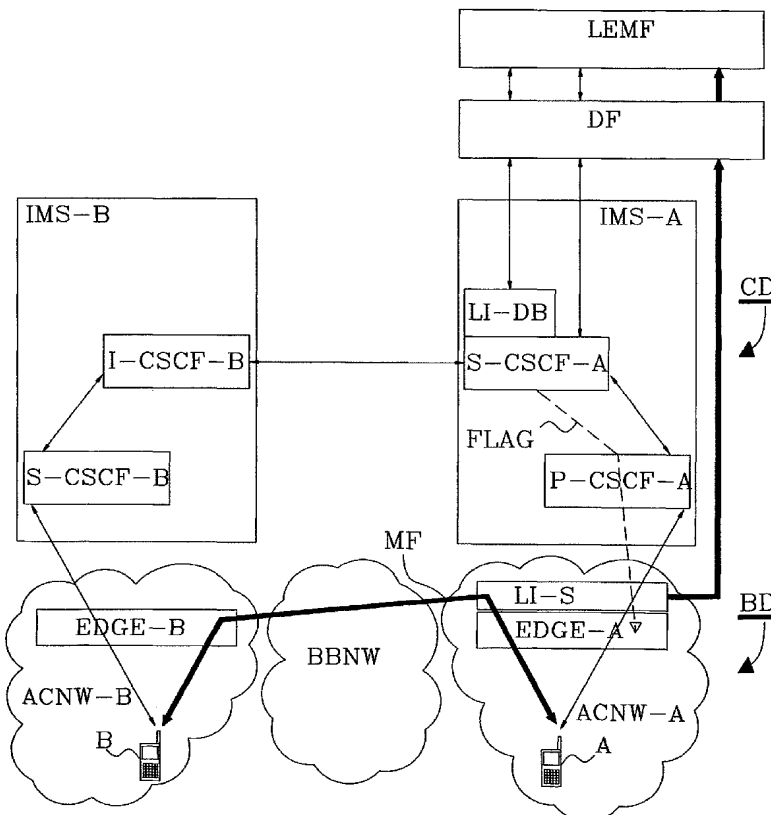
(57) **Abstract:** The present invention relates to a method for monitoring media flow in a telecommunication network. The network comprises a control domain handling session control and a bearer domain handling media flow. The method comprises the following steps: - Storing in a database (LI-DB) in the control domain, identification of a first subscriber (A) for which monitoring is desired. - Setting up a connection between the first subscriber (A) and a second subscriber (B). - Sending an indicator (FLAG) from the control domain to the bearer domain indicating that the media flow that involves the first subscriber (A) is to be monitored. - Re-routing said media flow between the subscribers, via a server function (LI-S) in the bearer domain. - Monitoring the media flow that passes the server function (LI-S).

WO 2005/025257 A1

MONITORING IN A TELECOMMUNICATION NETWORK

TECHNICAL FIELD OF THE INVENTION

The present invention relates to methods and arrangements for monitoring media flow in a telecommunication network that comprises a control domain that handles session control and a bearer domain that handles the media flow.

DESCRIPTION OF RELATED ART

Three major trends currently occurs in telecommunication, i.e. 1) increasing amount of data traffic, 2) real-time communication goes from circuit switching to packet switching, and 3) new focus of real-time in packet switching, for example video and multimedia. The ever increasing amount of data traffic as well as real-time communication in packet switched networks leads to a demand for monitoring of this data traffic with the same level of security and confidentiality as known from circuit switched networks monitoring. In circuit switched networks, e.g. telephony networks, it is customary to monitor communication connections from a remote operation centre so that a network operator wishing to operate real time traffic can constantly receive information on the quality of the communication lines. Another application of monitoring is lawful interception, i.e. the act of intercepting a communication on behalf of a law enforcement agency.

From the above, it is only natural that network operators will want to continue such monitoring approaches in other types of networks for example in packet switched networks.

One approach is described in the international application WO 02/102111. It is proposed to provide an interception unit to store an identification of a communication connection to be monitored. A copying unit hereby copy selected cells to a monitoring connection. The solution according to the

international application implies isolation of cells to be intercepted. The content of communication has according to the international application to be intercepted in the bearer network, which network does not naturally know the

5   identity of the intercepted target. This causes enhanced signalling in the network. There is also a technical possibility with the solution in the international application, for the end-user to find out with which IP address he is communicating, i.e. to find out that

10   interception is going on. This possibility is often considered as a drawback.

Requirements for lawful interception in 3GPP (3rd Generation Partnership Project) networks are being standardised within 3GPP and ETSI. So far requirements on IMS (IP Multimedia

15   Subsystem) for multimedia communication are only concerned with IRI (Intercept Related Information) and not with CC (Content of Communication), i.e. the media flow. The solutions specified so far within the standardisation work foresee interception only of IRI from IMS. This is a natural

20   consequence of the fact that CC is, for normal two-party sessions, not processed within IMS. This means that CC will have to be intercepted by involving the backbone or access network.

In a 3GPP environment an IMS subscriber is able to roam

25   between different access lines without necessarily being a subscriber in the backbone or access networks. The identification of the target may therefore require an extensive co-ordination of information from IMS and the backbone network and access network.

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SUMMARY OF THE INVENTION

The present invention relates to problems how to handle monitoring of a media flow when session control and media

flow uses different paths. In particular, problems arise when subscribers involved in the media flow move between different access networks.

The problems are solved by the invention by re-routing the session for which monitoring is desired, via a dedicated server function having a fixed location, which location is independent of change of location of subscribers involved in the media flow. The media flow that passes the dedicated server function is then monitored.

More in detail, the problem is solved by a method for monitoring media flow in a telecommunication network. The network comprises a control domain and a bearer domain. Session control is handled in the control domain and media flow is handled in the bearer domain. The method comprises the following steps:

- Storing in a database in the control domain, identification of a first subscriber for which monitoring is desired.

- Setting up a connection between the first subscriber and a second subscriber.

- Re-routing said media flow between the subscribers, via a dedicated monitoring server function in the bearer domain.

- Monitoring the media flow that passes the server function.

An arrangement according to the invention comprises means for performing the above mentioned method steps.

The object of the present invention is to make it possible to perform real-time monitoring of Content of Communication flow.

An advantage with the invention is that monitoring can be accomplished with a minimum of signalling between control-

and bearer domain, also when the monitored subscriber roams between different access networks.

Another advantage is that a minimum of adaptations of the normal network functions is required.

5   Yet another advantage is the possibility to conceal interception to involved subscribers and to other networks.

The invention will now be described more in detail with the aid of preferred embodiments in connection with the enclosed
10   drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 belongs to prior art and discloses a block schematic illustration of two subscribers located in
15   separate access networks. Control of the media flow is handled in a control domain and the media flow is handled in a bearer domain.

Figure 2 shows a block schematic illustration of two subscribers, each one located in one access networks. The
20   figure discloses interception according to the invention.

Figure 3 shows a flow chart illustrating a method used to initiate interception according to the invention.

Figure 4 shows a configuration where interception is hidden for involved subscribers.

25   Figure 5 shows a configuration where a subscriber has moved away from its home network.

DETAILED DESCRIPTION OF EMBODIMENTS

At first, interception of Intercept Related Information IRI according to current standardisation will be briefly discussed together with figure 1. Intercept Related
5   Information IRI is defined as signalling information related to subscribers. Figure 1 belongs to prior art and discloses a first mobile subscriber A and a second mobile subscriber B. The subscriber A is located in a first access network ACNW-A, which network is subscriber A´s home location.
10 Subscriber B is located in a second access network ACNW-B. Media flow MF, for example speech, is communicated between the subscribers A and B via a backbone network BBNW. The media flow is transported in a path in the bearer domain BD. The control of the media flow takes place in the control
15 domain CD. Control information can for example be, signalling during set-up of a call. The control information related to the A subscriber is handled in the IP multimedia subsystem domain IMS-A and the control information related to the B subscriber is handled in the IP multimedia
20 subsystem domain IMS-B. The control information passes several Call/Session Control Functions CSCF in both IMS-A and IMS-B. Requirements for interception of control information, also called Intercept related information IRI, are being standardised within the 3GPP and ETSI. Figure 1
25 discloses interception of IRI according to prior art. The control information is hereby copied into a lawful interception database LI-DB located in relation to a serving CSCF in IMS-A, i.e. S-CSCF-A. The information is then forwarded from the LI-DB to a lawful interception monitoring
30 facility LEMF, where the IRI is monitored. Information that is of interest to monitor can for example be if a certain subscriber has made a call, to whom the call was made and for how long time. After a call has been set-up between the subscriber A and B, the media flow MF between the
35 subscribers is routed via an edge-node EDGE-A in the access

network ACNW-A, the backbone network BBNW and via an edge-node EDGE-B in the access network ACNW-B.

According to the present invention, which now will be discussed, it is the content of communication that is of particular interest to monitor, i.e. the media flow MF in the bearer domain BD.

Figure 2 discloses interception according to the invention. The figure shows the same network as was disclosed in figure 1. A database, for example the lawful interception database LI-DB contains identification of what subscribers that are to be monitored. In this first embodiment, the first subscriber A is to be monitored and consequently an identification of A is stored in LI-DB. When a call is set-up between the subscriber A and the subscriber B, monitoring according to the invention takes place. The call set-up in this example involves the two IP multimedia domains IMS-A and IMS-B whereby control signalling is transferred between the domains. According to the invention an indicator FLAG is sent in connection with a call set-up involving the selected subscriber A, from the serving control function S-CSCF-A, via an interrogating control function P-CSCF-A to the access network ACNW-A. The FLAG is forwarded to the edge node EDGE-A in ACNW-A. When the indicator FLAG is received by EDGE-A in the access network ACNW-A a further node function i.e. a dedicated so-called lawful interception server function LI-S is initiated in ACNW-A. The LI-S is initiated by using an address that is predefined in EDGE-A to be used for re-routing of media flow via LI-S after arrival of the indicator FLAG. The media flow between the subscribers A and B is now re-routed to go via the lawful interception server function LI-S, compare figure 1. LI-S initiates a 3-part "conference" between A and B (the two original users) and a third user i.e. a Distribution Function DF. The distribution function is only a listener and is not to be recognised by A and B. Even if subscriber A should move from ACNW-A to

another network, the media flow would still be routed via
LI-S. The signalling in the control domain CD will by this
be minimised. This can be seen in a third embodiment
together with figure 5. During the whole media flow session,
5   the DF forwards all the content flowing in both directions
between A and B, from LI-S to a Lawful interception
Enforcement Monitoring Function LEMF. As an alternative, the
indicator FLAG might contain an adjusted IP address, which
is used by the edge node to address LI-S. In this case no
10   address to LI-S has to be predefined in the edge node. It is
also to be noted that the location of LI-S is an example and
that LI-S as well might be initiated somewhere else, for
example in the backbone network BBNW. The server function
LI-S does not have to be located in a physically separated
15   server function.

In figure 3 some essential steps of the invention is
disclosed in a flowchart. The flowchart is to be read
together with the earlier shown figure 2. The method
20   according to the invention comprises the following steps:

- Storing in the lawful interception database LI-DB,
    identification of the first subscriber A, which is to be
    intercepted. This step is shown in figure 3 by a block
25   101.
- A call set-up between the first subscriber A and the
    second subscriber B is initiated. A block 102 shows this
    step.
- The indicator FLAG is sent from the IP multimedia
30   subsystem IMS-A to the access network ACNW-A. A block 103
    shows this step.
- A dedicated lawful interception server function LI-S is
    initiated in ACNW-A. A block 104 shows this step.
- The media flow MF is routed between the subscribers A and
35   B via the lawful interception server function LI-S. A
    block 105 shows this step.

- The media flow is forwarded from LI-S to the Lawful
  Interception Monitoring Function LEMF where the MF is
  monitored. A block 106 shows this step.

A second embodiment is disclosed in figure 4. Figure 4 shows
parts of the network that has been disclosed in figure 2.
The media flow MF is like in the earlier embodiments
communicated between the first subscriber A and the second
subscriber B. The media flow is hereby communicated via the
edge-node EDGE-A in the access network ACNW-A, the lawful
interception server function LI-S in ACNW-A and via the
edge-node EDGE-B in the access network ACNW-B. In order to
hide the interception to involved subscribers, a different
addressing scheme has been implemented in this embodiment.
In this embodiment, the inherent notification of the LI-S
address is unknown by the edge node during the whole
monitoring session. The different addressing scheme is set-
up after reception of the notification to EDGE-A, that
subscriber A is to be intercepted. The media flow is re-
routed via the lawful interception server function LI-S, but
in this second embodiment the routing will be hidden. The
edge-node is hereby unaware of the lawful interception
server function LI-S and the subscriber A can not reach
information about LI-S from the edge-node. When a data
packet arrives from the subscriber A to the edge node,
instead of forwarding the packet to LI-S (unknown to EDGE-
A), the edge-node will send a request message 1 to the IP
multimedia subsystem domain IMS-A asking for an address to
subscriber B to forward the packet to. The IMS-A replies to
EDGE-A by sending a reply message 2 with an address to LI-S,
and EDGE-A uses this address to forward the packet to LI-S.
In the same way when LI-S is to send the packet arrived from
the edge node, the LI-S send a request message 3 to the IP
multimedia subsystem domain IMS-A asking for an address to

forward the packet to. The IMS-A replies to EDGE-A by sending a reply message 4 with an address to the second subscriber B.

5

The already mentioned third embodiment is disclosed in figure 5. The first subscriber A has, like in the earlier two embodiments, its home location in the first access networks ACNW-A. In this third embodiment however, the

10   subscriber A has moved temporarily to another network ACNW-C. ACNW-C comprises an edge node EDGE-C. The IP multimedia subsystem domain IMS-A will be involved in the session initiation between subscriber A and another subscriber, subscriber B in this case. The indicator FLAG will in this

15   case be sent from IMS-A to ACNW-C via an IP multimedia subsystem IMS-C. The indicator FLAG contains in this case an adjusted IP address, which is used by the edge node EDGE-C to address LI-S. The media flow MF between A and B will then be routed via the lawful interception server function

20   LI-S which is located in ACNW-A. This means that data packets in the media flow MF from subscriber A will be sent from the edge node EDGE-C, via LI-S in ACNW-A, to EDGE-B. Data packets in the media flow from subscriber B will be sent from EDGE-B, via LI-S in ACNW-A, to EDGE-C. The media

25   flow between the subscribers A and B is now routed to go via the lawful interception server function LI-S. LI-S initiates a 3-part "conference" between A and B (the two original users) and the Distribution Function DF. The distribution function is only a listener and is not to be recognised by A

30   and B.

Different variations are of course possible within the scope of the invention. The lawful interception server function LI-S can for example be located in the backbone

35   network BBNW or within the edge node EDGE-A. The two subscribers A and B can be situated in the same access network or in different access networks in different countries. In the embodiments, the subscriber A is the

monitored subscriber and if using standard telecommunication terminology it can be assumed that the subscriber A also is the calling subscriber while subscriber B is the called subscriber. It is to be noted that the claimed invention also covers cases when the monitored subscriber is the called subscriber. Also conference calls involving more than two parties is covered by the claimed invention and of course also when more than one subscriber in the conference is monitored. The subscriber unit for which interception is desired may have roamed to an access network in another country than the country of the subscribers home access network. It is important to observe that interception only is one type of monitoring for which the invention is applicable. Other types of monitoring might for example be monitoring of the type of media flow or quality measurements monitoring. The flag indicator is in the example sent during the call set-up session but can of course also be sent after the call set-up has finished in which case the media flow is re-routed via the lawful interception server function.

The invention is not limited to the above described and in the drawings shown embodiments but can be modified within the scope of the enclosed claims.

CLAIMS

1. Method for monitoring media flow in a telecommunication network comprising a control domain handling session control and a bearer domain handling media flow, which method comprises the following steps:

   - Storing in a database (LI-DB) in the control domain, identification of a first subscriber (A) for which monitoring is desired;

   - setting up a connection between the first subscriber (A) and a second subscriber (B); characterised by

   - re-routing said media flow between the subscribers, via a dedicated server function (LI-S) in the bearer domain;

   - monitoring the media flow that passes the server function (LI-S).

2. Method for monitoring media flow in a telecommunication network according to claim 1, which method comprises the following further step:

   - sending an indicator (FLAG) from the control domain to the bearer domain indicating that the media flow that involves the first subscriber (A) is to be monitored.

3. Method for monitoring media flow in a telecommunication network according to claim 2, which method comprises the following further step:

   - sending an address to the server function (LI-S) from the control domain to the bearer domain.

4. Method for monitoring media flow in a telecommunication
    network that comprises a control domain and a bearer
    domain, whereby session control is handled in the
    control domain and media flow is handled in the bearer
    domain, which method is *characterised* by re-routing of a
    media flow session for which monitoring is desired, via
    a fixed location (LI-S), which location is independent
    by change of location of subscribers involved in the
    media flow, which method comprises monitoring of the
    media flow when it passes the fixed location (LI-S).

5. Method for monitoring media flow in a telecommunication
    network according to claim 4, which method comprises the
    following further steps:

    -   storing in a database (LI-DB) in the control domain,
        identification of a first subscriber (A) for which
        monitoring is desired;

    -   setting up a connection between the first subscriber (A)
        and a second subscriber (B);

    -   routing said media flow between the subscribers (A, B) via
        the fixed location (LI-S) in the bearer domain.

6. Method for monitoring media flow in a telecommunication
    network according to claim 4 or 5, comprising the
    following further step:

    -   sending an indicator (FLAG) from the control domain to the
        bearer domain indicating that the media flow that involves
        the first subscriber (A) is to be monitored.

7.   Method for monitoring media flow in a telecommunication
     network according to any of claim 4 to 6, comprising the
     following further step:

-    Setting up a three-part conference between the two
     involved subscribers (A and B) and a monitoring function
     (LEMF), which monitoring function is a listener only
     function.

8.   Method for monitoring media flow in a telecommunication
     network according to any of claims 4-7, comprising the
     following further step:

-    exchanging an address to the dedicated server function
     (LI-S) against a pseudo address, to hide the routing of
     the media flow via the server function (LI-S) for the
     involved subscribers (A and B).

9.   Arrangement to monitor media flow in a telecommunication
     network comprising a control domain handling session
     control and a bearer domain handling media flow, which
     arrangement comprises:

-    means for storing in a database (LI-DB) in the control
     domain, identification of a first subscriber (A) for which
     monitoring is desired.

-    means for setting up a connection between the first
     subscriber (A) and a second subscriber (B);

-    means for sending an indicator (FLAG) from the control
     domain to the bearer domain indicating that the media flow
     that involves the first subscriber (A) is to be monitored;

- means for re-routing said media flow between the subscribers, via a server function (LI-S) in the bearer domain;

- means for monitoring the media flow that passes the server
5   function (LI-S).

10. Arrangement to monitor media flow in a telecommunication network according to claim 9, comprising:

- means for setting up a three-part conference between the
10   two involved subscribers (A and B) and a distribution function (DF), where the distribution function is a listener only function.

11. Arrangement to monitor media flow in a telecommunication
15   network according to any claims 9 or 10, comprising:

- means for exchanging an address to the dedicated server function (LI-S) against a pseudo address, to hide the routing of the media flow via the server function (LI-S) for the involved subscribers (A and B).
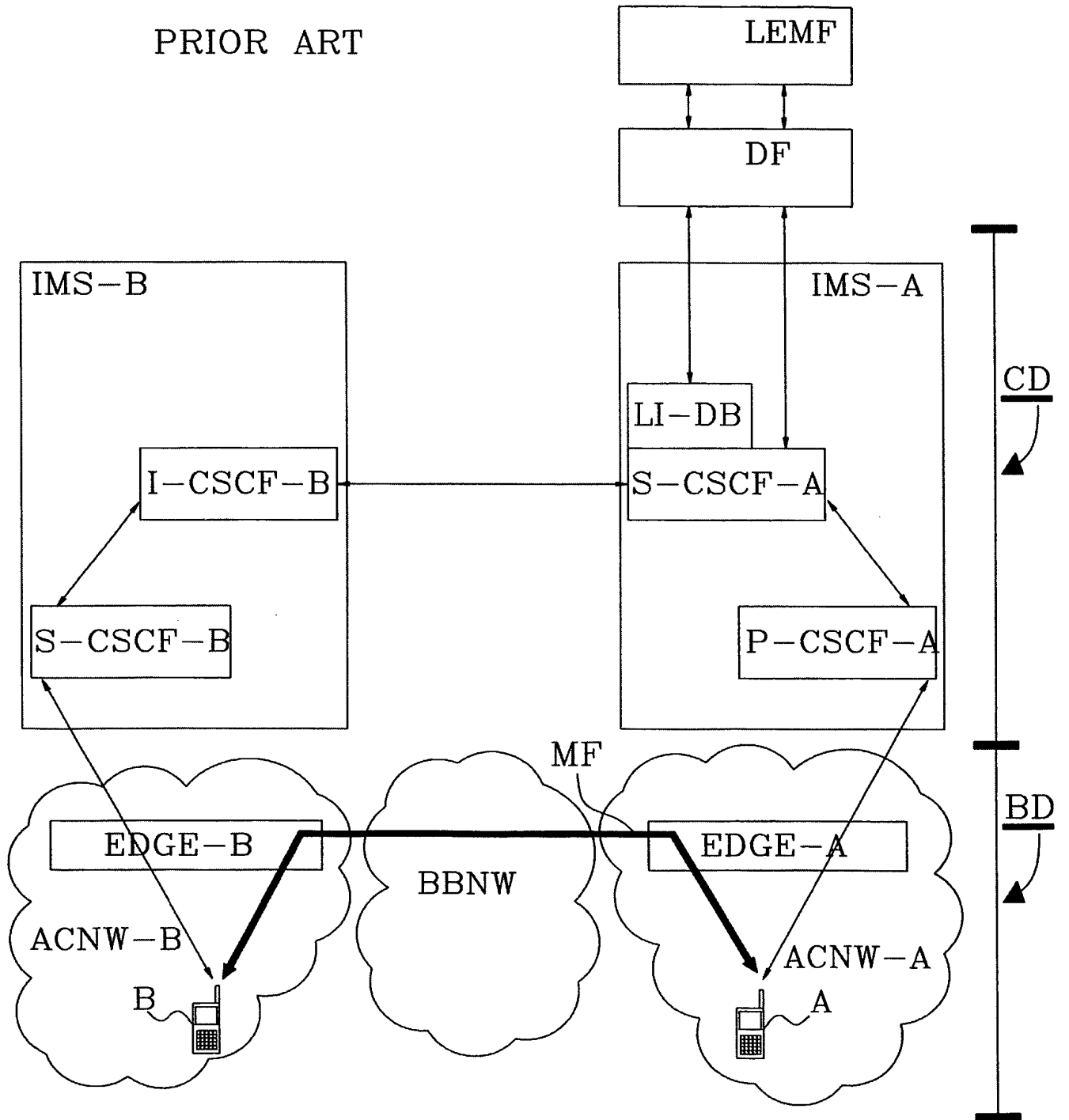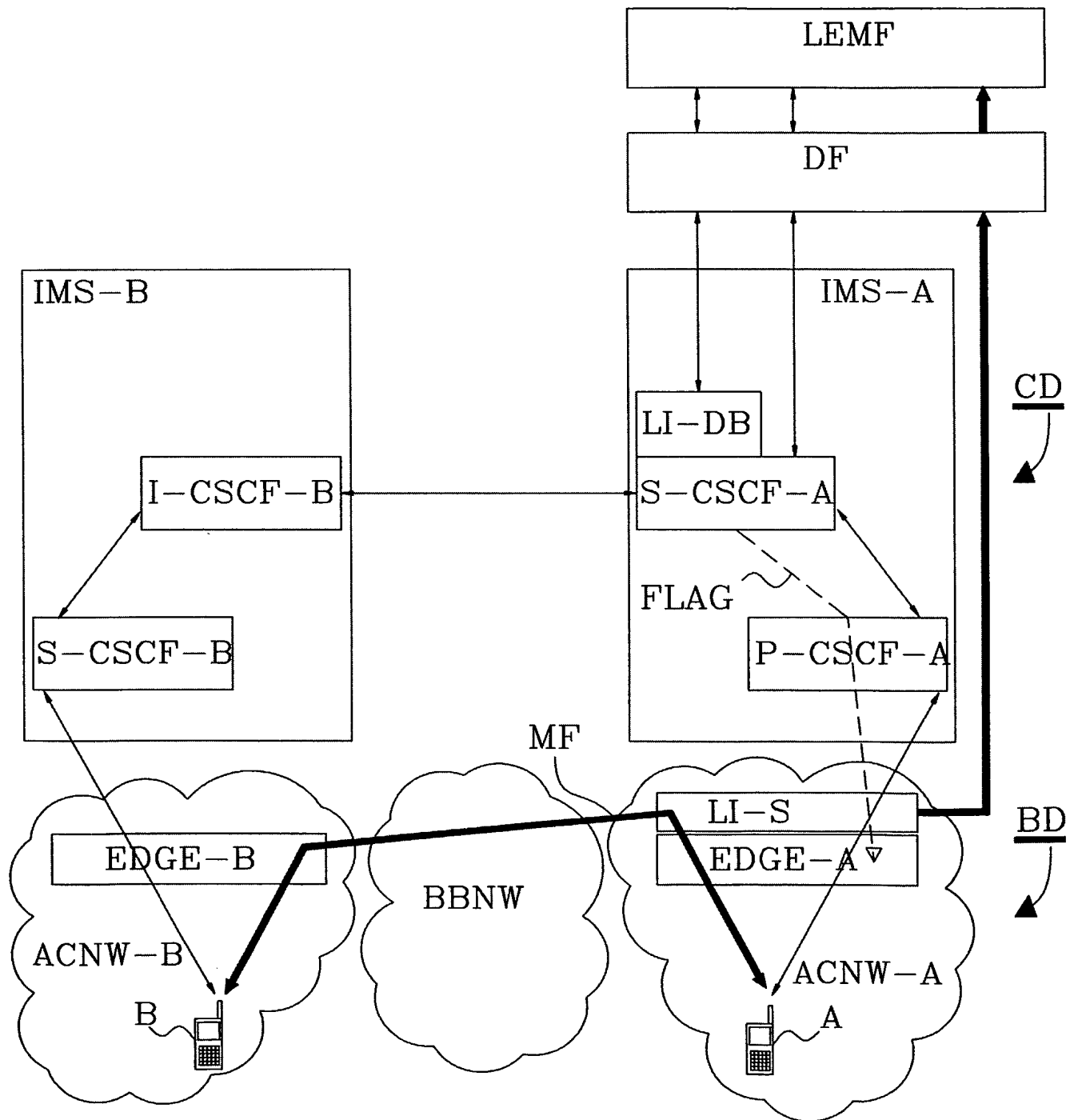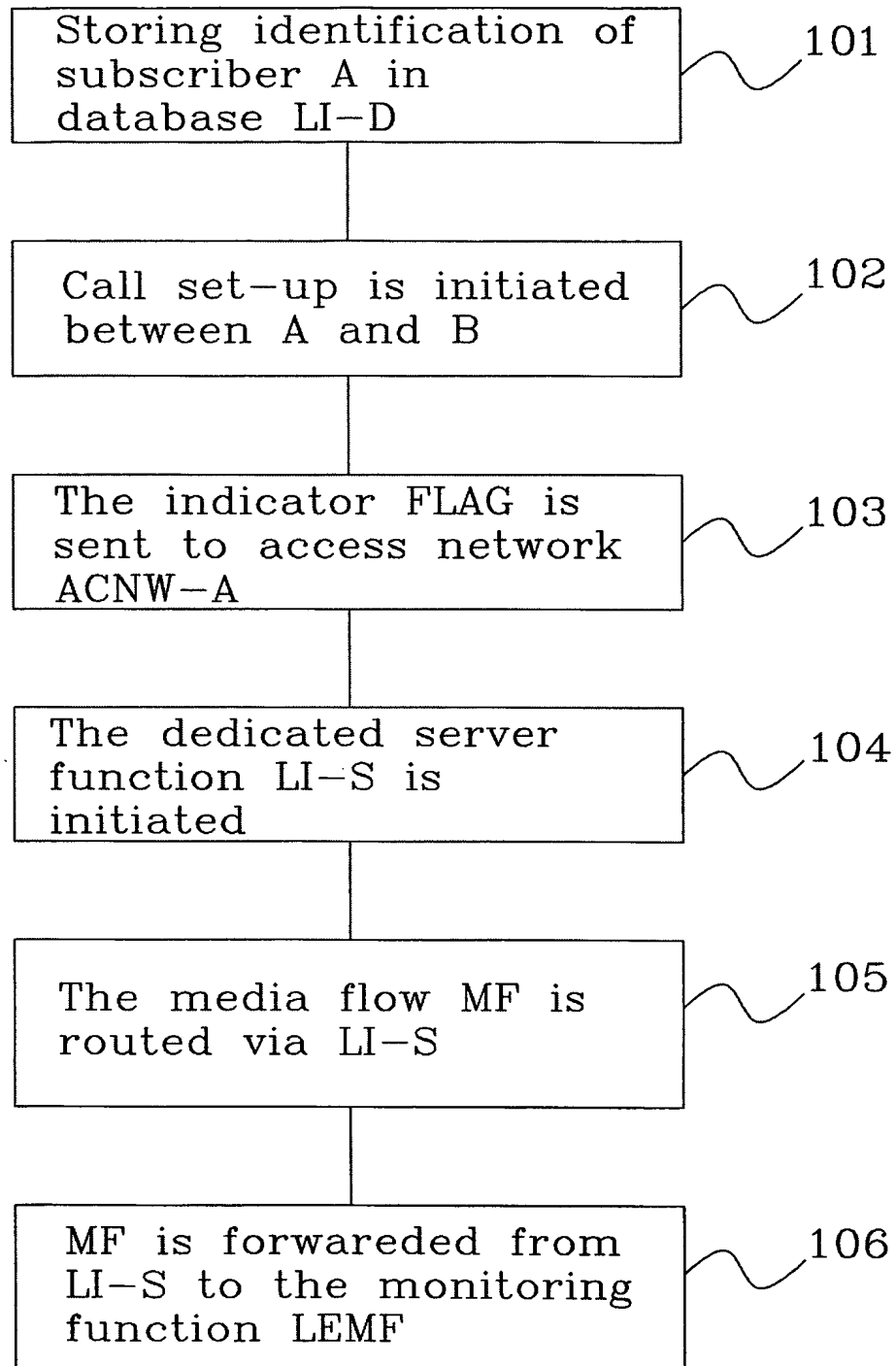
20

Fig. 1

Fig. 2

3/5

```
┌────────────────────────────────┐
│ Storing  identification  of    │ ⌇ 101
│ subscriber  A  in              │
│ database  LI-D                 │
└────────────────────────────────┘
                │
┌────────────────────────────────┐
│ Call  set-up  is  initiated    │ ⌇ 102
│ between  A  and  B             │
└────────────────────────────────┘
                │
┌────────────────────────────────┐
│ The  indicator  FLAG  is       │ ⌇ 103
│ sent  to  access  network      │
│ ACNW-A                         │
└────────────────────────────────┘
                │
┌────────────────────────────────┐
│ The  dedicated  server         │ ⌇ 104
│ function  LI-S  is             │
│ initiated                      │
└────────────────────────────────┘
                │
┌────────────────────────────────┐
│ The  media  flow  MF  is       │ ⌇ 105
│ routed  via  LI-S              │
└────────────────────────────────┘
                │
┌────────────────────────────────┐
│ MF  is  forwareded  from       │ ⌇ 106
│ LI-S  to  the  monitoring      │
│ function  LEMF                 │
└────────────────────────────────┘
```
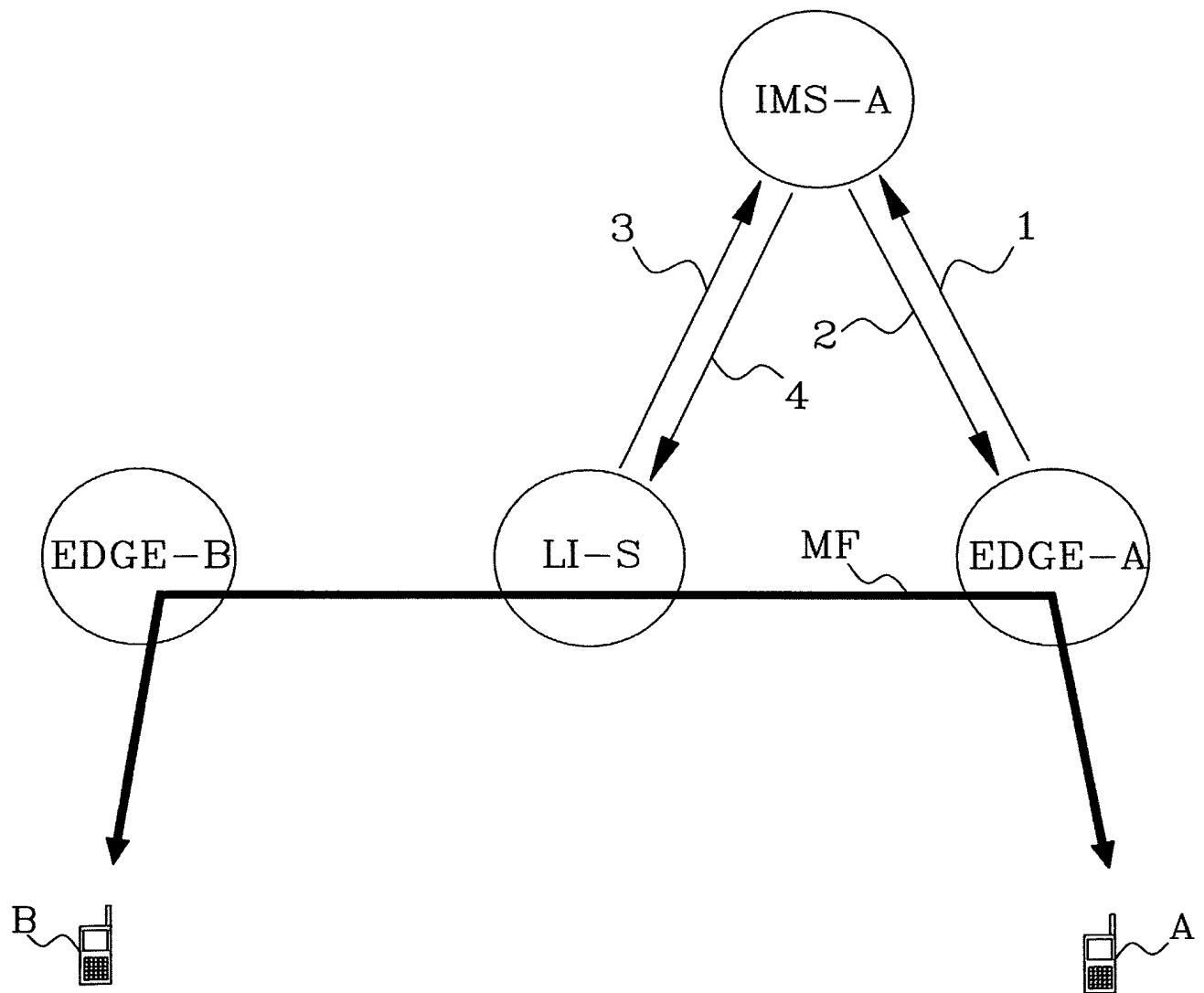
Fig. 3

Fig 4

Fig. 5